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HOUSTON ELISEEVA
4 MILITIA DRIVE, SUITE 4
LEXINGTON, MA 02421

EXAMINER	
THANGAVELU, KANDASAMY	

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2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No.	Applicant(s)	
	10/738,931	VERDYCK, DIRK	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 12 November 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 and 23-27 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 and 23-27 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Applicant's Response dated November 12, 2007. Claims 1-5, 7-14, 16-20 and 23 were amended. Claims 21-22 were canceled. Claims 24-27 were added. Claims 1-20 and 23-27 of the application are pending. This office action is made non-final.

Claim Objections

2. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

3. Claims 1-6, 8, 9 and 11-19 are objected to because of the following informalities:

In claim 1, Lines 15-16, "the measures of the graphical output as the function of at least the parameter related to the heat sink temperature" appears to be incorrect and it appears that it should be "the measures of the graphical output as the function of at least the parameters related to the heat sink temperatures", since there is a measure of graphical output for a parameter related to a heat sink temperature and several regions are printed with different steady state amount of heat energy resulting different heat sink temperatures and different values of parameters related to heat sink temperatures.

In claim 2, Line 1, "A method according to claim 1" appears to be incorrect and it appears that it should be "The method according to claim 1".

In claim 3, Line 1, "A method according to claim 1" appears to be incorrect and it appears that it should be "The method according to claim 1".

In claim 4, Line 1, "A method according to claim 1" appears to be incorrect and it appears that it should be "The method according to claim 1".

In claim 4, Line 3, "the steady state amount of energy (E_n or t_{exc})" appears to be incorrect and it appears that it should be "the steady state amount of energy (E_n)", since one variable "the steady state amount of energy" cannot be represented by two symbols E_n or t_{exc}.

In claim 5, Line 1, "A method according to claim 4" appears to be incorrect and it appears that it should be "The method according to claim 4".

In claim 6, Line 1, "A method according to claim 4" appears to be incorrect and it appears that it should be "The method according to claim 4".

In claim 8, Lines 12-13, "the graphical output (d_n)" appears to be incorrect and it appears that it should be "the graphical output ", since the symbol (d_n) is used to represent the measures of the graphical output and not the graphical output.

In claim 8, Lines 15-16, "the measures of the graphical output (d_n) as the function of at least the parameter related to the heat sink temperature" appears to be incorrect

and it appears that it should be "the measures of the graphical output (d_n) as the function of at least the parameters related to the heat sink temperatures", since there is a measure of graphical output for a parameter related to a heat sink temperature and several regions are printed with different steady state amount of heat energy resulting different heat sink temperatures and different values of parameters related to heat sink temperatures.

In claim 8, Lines 21-22, the equations are not clearly legible. Since the claims in the last amendment will be used to print the claims in the allowed patent, the applicant is directed to provide claim set with equations that are clearly legible.

In claim 8, Line 17, $d_i=f(t_{exc})$ implies that d_i is a measure of graphical output just as d_n. Is this correct?

In claim 9, Lines 1-2, "said graphical output (d_n)" appears to be incorrect and it appears that it should be "said graphical output ", since the symbol (d_n) is used to represent the measures of the graphical output and not the graphical output.

In claim 9, Line 2, "in a center of the pixel" appears to be incorrect and it appears that it should be "at center of the pixel".

In claim 11, Line 1, "A method according to claim 10" appears to be incorrect and it appears that it should be "The method according to claim 10".

In claim 12, Line 1, "A method according to claim 10" appears to be incorrect and it appears that it should be "The method according to claim 10".

In claim 13, Line 1, "A method according to claim 10" appears to be incorrect and it appears that it should be "The method according to claim 10".

In claim 14, Line 1, "A method according to claim 13" appears to be incorrect and it appears that it should be "The method according to claim 13".

In claim 15, Line 1, "A method according to claim 13" appears to be incorrect and it appears that it should be "The method according to claim 13".

In claim 16, Line 1, "A method according to claim 10" appears to be incorrect and it appears that it should be "The method according to claim 10".

In claim 17, Lines 12-13, "the graphical output measure (d_n) was printed" appears to be incorrect and it appears that it should be "the graphical output measure (d_n) was printed", since it is not possible to print the graphical output measure, but only a graphical output.

In claim 17, Lines 29-30, the equations are not clearly legible. Since the claims in the last amendment will be used to print the claims in the allowed patent, the applicant is directed to provide claim set with equations that are clearly legible.

In claim 17, Line 24, $d_i=f(t_{exc})$ implies that d_i is a measure of graphical output just as d_n. Is this correct?

In claim 18, Lines 1-2, "said graphical output (d_n)" appears to be incorrect and it appears that it should be "said graphical output ", since the symbol (d_n) is used to represent the measures of the graphical output and not the graphical output.

In claim 18, Lines 2-3, "in a center of the pixel" appears to be incorrect and it appears that it should be "at center of the pixel".

In claim 19, Line 13, "in a thermal state" appears to be incorrect and it appears that it should be "in a thermal steady state".

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 2 and 4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Claim 2, Line 1, there is insufficient antecedent basis for " the heat energy ", since claim 1 refers to only "a steady state amount of heat energy".

In Claim 4, Line 3, there is insufficient antecedent basis for " the steady state amount of energy ", since claim 1 refers to only "a steady state amount of heat energy".

6. Claims 1-20 and 23-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This is because these claims use vague and indefinite terms making the claims indefinite.

6.1 Claim 1, Lines 8-9 state, "a different steady state amount of heat energy delivered to the heater elements associated with that region". Does this mean that several heater elements are associated with a region? Where is it shown in the figure or described in the specification? Since the heater elements are in the X direction, perpendicular to direction of movement of the thermographic paper, how long is a region in the X direction?

Claim 1, Lines 10-11 state, "a parameter relating to temperature of the heat sink". What is a parameter relating the temperature of the heat sink? How is it calculated and what is it called? Where is it described in the specification? How is it different from the temperature of the heat sink?

Claim 1, Lines 11-13 state, "for each of the several printed regions measured in a zone of each region where the graphical output was printed". What is a region? What is a zone? How are they related? Figure 20 shows Item 34, which is described on Page 44, Lines 19-20 as several printed regions. Therefore, the printed regions are in the direction of movement of the paper. Figure 22 shows several zones printed in the direction of movement of the media. It appears that the region and zone are same. If so what is meant by zone of region?

Claim 1, Lines 10-13 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state". This means that the measure of graphical output is functionally correlated with the temperature of the heat sink. What is the process involved in establishing this functional relationship? Does this mean the functional relationship is of the form $d_n = f(T_{HS})$?

Claim 1, Lines 10-12 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions". Figure 1 shows the thermal print head, 2. It has the print head support, 6 and a heat sink structure 24. Specification Page 5, Lines 8-9 state that the biggest part of the heat energy goes to the thermal head support with the heat sink. Lines 13-14 state that thermal heads with a large heat flow to the heat sink allow to print faster than heads with limited heat leakage to the heat sink. Therefore, it is implied that heat sink is part of the thermal head. Specification Page 8, Line 12-17 state that thermal sensors are mounted at several places in the thermal head; from the output of these sensors, a reference temperature can be calculated for every nib in the head; this reference temperature is often the temperature of the heat sink close to the considered nibs. This also implies that what the applicant called as temperature of the heat sink is same as the temperature of the thermal head at the nib. Specification page 20, Lines 14-15 state that the invention concentrates on the effect of heat sink temperature in the print head. This also implies that heat sink temperature and the thermal head temperature mean one and the same. Specification page 23, Lines 10-14 state that the whole heat sink has a homogeneous

temperature, meaning that heater elements should be excited all over the thermal head, giving a good symmetrical heating of the heat sink; the definition of T_{HS} is a mean value of the heat sink temperature taken all along the heat sink. This also implies that the heat sink temperature is same as the thermal head temperature. Therefore, should the examiner assume the heat sink temperature and the thermal head temperature mean one and the same?

Claim 1, Lines 14 to 17 state, "establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as the function of at least the parameter related to the heat sink temperature and the steady state amounts of heat energy". This language is not understood. It is very vague and indefinite and the applicant is directed to explain this language. The "the measures of the graphical output as the function of at least the parameter related to the heat sink temperature" was used in the previous paragraph and was interpreted as the functional relationship is of the form $d_n = f(T_{HS})$. Then is the best fit relationship established a relationship between the d_n and the steady state amounts of heat energy? Is it of the form $d_n = f(E_n)$? If so when do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$? Or is the relationship $d_n = f(T_{HS}, E_n)$?

Specification Page 7, Lines 17-20 state that the graphical output of the calibration printout can be linked with the excitation used on the heater element and the heat sink temperature, if necessary supplemented with additional parameters. Does this mean the graphical output is a function of excitation time t_{exc}? Specification Page 8, Lines 18-24 state that the invention relates to a mathematical model relating the graphical output d_n of the heater element in a function of the heat sink temperature T_{ref} of every heater element and the used steady state amount of heat energy E_n. The function is written as: $d_n = f(T_{ref}, E_n)$. Specification

Page 10, Line 17 shows d only as a function of T_{ref} and t, which is the excitation time. The energy is not used here. If the functional relationship can be written as $d_n = f(T_{ref}, E_n)$ or $d_n = f(T_{ref}, t_{exc})$, it would be better to write to sets of claims one for the energy relationship and another for excitation relationship, to make clear what the applicant is intending to state.

Specification Page 20, Line 30 gives Equation 2 as $d = f(T_{HS}, t_{exc})$. Specification Page 22, Line 27 gives d = f(T_{HS}, $t_{exc,}$ <other parameters>). Does this mean in reality, all the modeling is done using only the excitation time t_{exc} and not steady state amount of heat energy E_n? If so, does the applicant just claim to correlate d_n with T_{HS} and E_n, but not really do so? Or if he is correlating d_n with T_{HS} and $E_{n,}$ where is the procedure for converting t_{exc} to E_n and correlating d_n with T_{HS} and E_n described in the specification?

6.2 Claim 2 states, "the heat energy E_n is represented by a given equivalent time (t_{exc}) used for powering at least one of the heater elements with an equivalent constant power (P_0), $E_n = t_{exc} * P_0$". Is heat energy represented by E_n or the steady state amount of heat energy represented by E_n? What is a given equivalent time t_{exc}? How do you calculate the given equivalent time? How is this time different from Claim 8, Lines 17-18, $d_i = f(t_{exc})$ where t_{exc} is an excitation time of a heater element? If you are using t_{exc} to mean excitation time, you cannot use the same symbol to mean another variable. Similarly, you cannot give two different names to the same symbol and variable, as that will make the claims vague and indefinite.

Claim 2, Lines 2-3 state, "a given equivalent time (t_{exc}) used for powering at least one of the heater elements". What is the meaning of "at least one of"? What was the intention of using this "at least one of"? If one of the heater elements is excited to t_{exc}, what happens to other

heater elements? If a plurality of heating elements is excited with t_{exc}, how does this affect E_n? What is an equivalent constant power and how is different from constant power? Where is it described in the specification?

6.3 Claim 4, Lines 2-3 and Line 4 state, "a steady state graphical output measure (d_n)". What is a steady state graphical output measure and how is it different from a measure of graphical output? How do determine that the graphical output measure is in steady state and where is it explained in the specification?

Claim 4, Line 3 states "the steady state amount of energy (E_n or t_{exc})". You cannot use two symbols to mean the steady state amount of energy in the claims and specification. Since E_n is used for the steady state amount of energy, and t_{exc} is described as excitation time, you should follow the same convention. Otherwise the claim is vague and indefinite. Line 5 states, "and its controlling parameter (E_n, or t_{exc})". If E_n is used for the steady state amount of energy, and t_{exc} is used for excitation time, you cannot call them by different names as that will result in confusion and the claim will be treated as vague and indefinite.

6.4 Claim 5, Lines 2-3 state, "parameters (P_n) that are determinative of the steady state graphical output measure (d_n)". What is a steady state graphical output measure and how is it different from a measure of graphical output? How do determine that the graphical output measure is in steady state and where is it explained in the specification? What are the parameters (P_n) that are determinative of the steady state graphical output measure (d_n)? How do you measure them? How do you include them in the mathematical model? What is the purpose of

this claim if the table includes some parameters but you do not claim to include them in the mathematical model? The parameters (P_n) are vague and indefinite unless you describe them somewhere in the claims.

6.5 Claim 6 states, "the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T)". Since claim 4 states that the table includes the steady state amount of energy (E_n or t_{exc}), but does not mention heat sink temperature, does this mean that claims 4-6 deal with mathematical models of the form $d = f(E_n)$ and $d = f(t_{exc})$ only and not $d = f(T_{HS}, t_{exc})$? When do you use $d = f(T_{HS})$, $d = f(E_n)$ and $d = f(t_{exc})$ and $d = f(T_{HS}, t_{exc})$? What are the rules for using them? Where are they described in the specification?

6.6 Claim 8, Lines 8-9 state, "a different steady state amount of heat energy (E_n) delivered to the heater elements associated with that region". The "heater elements associated with that region" is vague and indefinite as explained in Paragraph 6.1 above.

Claim 8, Lines 10-11 state, "a parameter relating to temperature of the heat sink". What is a parameter relating the temperature of the heat sink? How is it calculated and what is it called? Where is it described in the specification? How is it different from the temperature of the heat sink?

Claim 8, Lines 11-13 state, "for each of the several printed regions measured in a zone of each region where the graphical output was printed". What is a region? What is a zone? How are

they related? Figure 20 shows Item 34, which is described on Page 44, Lines 19-20 as several printed regions. Therefore, the printed regions are in the direction of movement of the paper. Figure 22 shows several zones printed in the direction of movement of the media. It appears that the region and zone are same. If so what is meant by zone of region?

Claim 8, Lines 10-13 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state". This means that the measure of graphical output is functionally correlated with the temperature of the heat sink. What is the process involved in establishing this functional relationship? Does this mean the functional relationship is of the form $d_n = f(T_{HS})$?

Claim 8, Lines 10-12 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions". Is the heat sink part of the thermal head? Is what the applicant called temperature of the heat sink same as the temperature of the thermal head at the nib? Do the heat sink temperature and the thermal head temperature mean one and the same? The applicant is directed to the discussion in Paragraph 6.1 above.

Claim 8, Lines 14 to 17 state, "establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as the function of at least the parameter related to the heat sink temperature and the steady state amounts of heat energy". This language is not understood. It is very vague and indefinite and the applicant is directed to

explain this language. The "the measures of the graphical output as the function of at least the parameter related to the heat sink temperature" was used in the previous paragraph and was interpreted as the functional relationship is of the form $d_n = f(T_{HS})$. Then is the best fit relationship established a relationship between the d_n and the steady state amounts of heat energy? Is it of the form $d_n = f(E_n)$? If so when do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$? Or is the relationship $d_n = f(T_{HS}, E_n)$?

Specification Page 7, Lines 17-20 state that the graphical output of the calibration printout can be linked with the excitation used on the heater element and the heat sink temperature, if necessary supplemented with additional parameters. Does this mean the graphical output is a function of excitation time t_{exc}? Specification Page 8, Lines 18-24 state that the invention relates to a mathematical model relating the graphical output d_n of the heater element in a function of the heat sink temperature T_{ref} of every heater element and the used steady state amount of heat energy E_n. The function is written as: $d_n = f(T_{ref}, E_n)$. Specification Page 10, Line 17 shows d only as a function of T_{ref} and t, which is the excitation time. The energy is not used here. If the functional relationship can be written as $d_n = f(T_{ref}, E_n)$ or $d_n = f(T_{ref}, t_{exc})$, it would be better to write to sets of claims one for the energy relationship and another for excitation relationship, to make clear what the applicant is intending to state.

Specification Page 20, Line 30 gives Equation 2 as $d = f(T_{HS}, t_{exc})$.. Specification Page 22, Line 27 gives d = f(T_{HS}, t_{exc}, <other parameters>). Does this mean in reality, all the modeling is done using only the excitation time t_{exc} and not steady state amount of heat energy E_n? If so, does the applicant just claim to correlate d_n with T_{HS} and E_n, but not really do so? Or if he is

correlating d_n with T_{HS} and E_n, where is the procedure for converting t_{exc} to E_n and correlating d_n with T_{HS} and E_n described in the specification?

Claim 8, Lines 17-18 state, "the best fit relationship is given by $d_i=f(t_{exc})$ where t_{exc} is an excitation time of a heater element". Is d_i same as the measures of the graphical output (d_n)? What is the significance of using d_i in stead of d_n? When do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$ and $d_n=f(t_{exc})$? Or is the relationship $d_n = f(T_{HS}, E_n)$ or $f(T_{HS}, t_{exc})$? Do you mean to say that you use all these numerous relationships and claim all these? If so what are the rules to decide when to use one these numerous relationships and where are they described in the specification?

Claim 8, Lines 18-19 state, "this relationship is corrected when using the printing system at a different line time by adding an offset Δt_{exc} to t_{exc}". What is the purpose of this correction? What is the line time? What is the reference line time? While the Examiner can interpret the claim using the description provided in the specification, the Examiner is required to use wide interpretation of the terms in rejecting the claims. Therefore, the applicant is required to provide meanings of line time and reference line time in this claim. When do you need to correct this t_{exc}? What are the rules for correction? How does it affect the mathematical model used to control the print head? This whole correction process is not understood. May be the various steps involved in this correction process should all be included in this claim. The variable "i" is not defined in the equation.

6.7 Claim 10, Lines 8-9 state, "a different constant amount of heat energy delivered to the heater elements associated with that region". The "heater elements associated with that region" is vague and indefinite as explained in Paragraph 6.1 above.

Claim 10, Lines 10-11 state, "a parameter related to temperature of the heat sink". What is a parameter related the temperature of the heat sink? How is it calculated and what is it called? Where is it described in the specification? How is it different from the temperature of the heat sink?

Claim 10, Lines 11-13 state, "for each of the several printed regions measured in a zone of each region where the graphical output was printed". What is a region? What is a zone? How are they related? Figure 20 shows Item 34, which is described on Page 44, Lines 19-20 as several printed regions. Therefore, the printed regions are in the direction of movement of the paper. Figure 22 shows several zones printed in the direction of movement of the media. It appears that the region and zone are same. If so what is meant by zone of region?

Claim 10, Lines 10-13 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state". This means that the measure of graphical output is functionally correlated with the temperature of the heat sink. What is the process involved in establishing this functional relationship? Does this mean the functional relationship is of the form $d_n = f(T_{HS})$?

Claim 10, Lines 10-12 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions". Is the heat sink part of the thermal head? Is what the applicant called temperature of the heat sink same as the temperature of the thermal head at the nib? Do the heat sink temperature and the thermal head temperature mean one and the same? The applicant is directed to the discussion in Paragraph 6.1 above.

Claim 10, Lines 14 to 16 state, "establishing the mathematical model by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy". This language is not understood. It is very vague and indefinite and the applicant is directed to explain this language. The "the measures of the graphical output as the function of at least the parameter related to the heat sink temperature" was used in the previous paragraph and was interpreted as the functional relationship is of the form $d_n = f(T_{HS})$. Then is the best fit relationship established a relationship between the d_n and the constant amounts of heat energy? Is it of the form $d_n = f(E_n)$? If so when do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$? Or is the relationship $d_n = f(T_{HS}, E_n)$?

Specification Page 7, Lines 17-20 state that the graphical output of the calibration printout can be linked with the excitation used on the heater element and the heat sink temperature, if necessary supplemented with additional parameters. Does this mean the graphical output is a function of excitation time t_{exc}? Specification Page 8, Lines 18-24 state that the invention relates to a mathematical model relating the graphical output d_n of the heater element in a function of the heat sink temperature T_{ref} of every heater element and the used steady state amount of heat energy E_n. The function is written as: $d_n = f(T_{ref}, E_n)$. Specification

Page 10, Line 17 shows d only as a function of T_{ref} and t, which is the excitation time. The energy is not used here. If the functional relationship can be written as $d_n = f(T_{ref}, E_n)$ or $d_n = f(T_{ref}, t_{exc})$, it would be better to write to sets of claims one for the energy relationship and another for excitation relationship, to make clear what the applicant is intending to state.

Specification Page 20, Line 30 gives Equation 2 as $d = f(T_{HS}, t_{exc})$. Specification Page 22, Line 27 gives d = f(T_{HS}, $t_{exc,}$ <other parameters>). Does this mean in reality, all the modeling is done using only the excitation time t_{exc} and not steady state amount of heat energy E_n? If so, does the applicant just claim to correlate d_n with T_{HS} and E_n, but not really do so? Or if he is correlating d_n with T_{HS} and $E_{n,}$ where is the procedure for converting t_{exc} to E_n and correlating d_n with T_{HS} and E_n described in the specification?

Claim 10, Lines 17-19 state, "determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model for printing of an image on the thermographic material". What is the meaning of "at least one"? What was the intention of using this "at least one"? If one of the heater elements is excited to t_{exc}, what happens to other heater elements? As per the claim Line 9, there are several hater elements associated with the region. If a plurality of heating elements is excited with t_{exc}, how does this affect E_n? In addition, if the mathematical model is of the form $f(T_{HS}, t_{exc})$ as shown in Specification Page 20, Line 30 or d = f(T_{HS}, $t_{exc,}$ <other parameters>) as shown in Specification Page 22, Line 27, you can only determine the excitation time and not the heat energy supplied to the energisable heater element. Additionally, you cannot determine the heat energy, only the amount of heat energy supplied.

6.8 Claim 11 states, "the heat energy E_n is represented by a given equivalent time (t_{exc}) used for powering at least one of the heater elements with an equivalent constant power (P_0), $E_n=t_{exc}*P_0$". Is heat energy represented by E_n or the steady state amount of heat energy represented by E_n? What is a given equivalent time t_{exc}? How do you calculate the given equivalent time? How is this time different from Claim 8, Lines 17-18, $d_i=f(t_{exc})$ where t_{exc} is an excitation time of a heater element? If you are using t_{exc} to mean excitation time, you cannot use the same symbol to mean another variable. Similarly, you cannot give two different names to the same symbol and variable, as that will make the claims vague and indefinite.

Claim 2, Lines 2-3 state, "a given equivalent time (t_{exc}) used for powering the heater elements". Does this mean that all the heater elements in a region are excited to t_{exc} to provide same amount of energy E_n? What is an equivalent constant power and how is different from constant power? Where is it described in the specification?

6.9 Claim 13, Lines 2-3 state, "a steady state graphical output measure (d_n)". What is a steady state graphical output measure and how is it different from a measure of graphical output? How do determine that the graphical output measure is in steady state and where is it explained in the specification?

Claim 13, Line 3 states "the steady state amount of energy (E_n or t_{exc})". You cannot use two symbols to mean the steady state amount of energy in the claims and specification. Since E_n is used for the steady state amount of energy, and t_{exc} is described as excitation time, you should follow the same convention. Otherwise the claim is vague and indefinite. Line 5 states, "and its controlling parameter (E_n, or t_{exc})". If E_n is used for the steady state amount of energy, and t_{exc} is

used for excitation time, you cannot call them by different names as that will result in confusion and the claim will be treated as vague and indefinite.

6.10 Claim 14, Lines 2-3 state, "parameters (P_n) that are determinative of the steady state graphical output measure (d_n)". What are the parameters (P_n) that are determinative of the steady state graphical output measure (d_n)? How do you measure them? How do you include them in the mathematical model? What is the purpose of this claim if the table includes some parameters but you do not claim to include them in the mathematical model? The parameters (P_n) are vague and indefinite unless you describe them somewhere in the claims.

6.11 Claim 15 states, "the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T)". Since claim 13 states that the table includes the steady state amount of energy (E_n or t_{exc}), but does not mention heat sink temperature, does this mean that claims 13-15 deal with mathematical models of the form $d = f(E_n)$ and $d = f(t_{exc})$ only and not $d = f(T_{HS}, t_{exc})$? When do you use $d = f(T_{HS})$, $d = f(E_n)$ and $d = f(t_{exc})$ and $d = f(T_{HS}, t_{exc})$? What are the rules for using them? Where are they described in the specification?

6.12 Claim 17, Lines 8-9 state, "a different constant amount of heat energy delivered to the heater elements associated with that region". The "heater elements associated with that region" is vague and indefinite as explained in Paragraph 6.1 above.

Claim 17, Lines 10-11 state, "a parameter related to temperature of the heat sink". What is a parameter related the temperature of the heat sink? How is it calculated and what is it called? Where is it described in the specification? How is it different from the temperature of the heat sink?

Claim 17, Lines 11-13 state, "for each of the several printed regions measured in a zone of each region where the graphical output measure (d_n) was printed". What is a region? What is a zone? How are they related? Figure 20 shows Item 34, which is described on Page 44, Lines 19-20 as several printed regions. Therefore, the printed regions are in the direction of movement of the paper. Figure 22 shows several zones printed in the direction of movement of the media. It appears that the region and zone are same. If so what is meant by zone of region? Is the graphical output was printed or the graphical output measure (d_n) was printed?

Claim 17, Lines 10-13 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions measured in a zone of each region where the graphical output measure (d_n) was printed in a thermal steady state". This means that the measure of graphical output is functionally correlated with the temperature of the heat sink. What is the process involved in establishing this functional relationship? Does this mean the functional relationship is of the form $d_n = f(T_{HS})$? What is meant by the graphical output measure (d_n) was printed?

Claim 17, Lines 10-12 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed

regions". Is the heat sink part of the thermal head? Is what the applicant called temperature of the heat sink same as the temperature of the thermal head at the nib? Do the heat sink temperature and the thermal head temperature mean one and the same? The applicant is directed to the discussion in Paragraph 6.1 above.

Claim 17, Lines 14 to 16 state, "establishing the mathematical model by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy". This language is not understood. It is very vague and indefinite and the applicant is directed to explain this language. The "the measures of the graphical output as the function of at least the parameter related to the heat sink temperature" was used in the previous paragraph and was interpreted as the functional relationship is of the form $d_n = f(T_{HS})$. Then is the best fit relationship established a relationship between the d_n and the constant amounts of heat energy? Is it of the form $d_n = f(E_n)$? If so when do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$? Or is the relationship $d_n = f(T_{HS}, E_n)$?

Specification Page 7, Lines 17-20 state that the graphical output of the calibration printout can be linked with the excitation used on the heater element and the heat sink temperature, if necessary supplemented with additional parameters. Does this mean the graphical output is a function of excitation time t_{exc}? Specification Page 8, Lines 18-24 state that the invention relates to a mathematical model relating the graphical output d_n of the heater element in a function of the heat sink temperature T_{ref} of every heater element and the used steady state amount of heat energy E_n. The function is written as: $d_n = f(T_{ref}, E_n)$. Specification Page 10, Line 17 shows d only as a function of T_{ref} and t, which is the excitation time. The energy is not used here. If the functional relationship can be written as $d_n = f(T_{ref}, E_n)$ or $d_n =$

$f(T_{ref}, t_{exc})$, it would be better to write to sets of claims one for the energy relationship and another for excitation relationship, to make clear what the applicant is intending to state.

Specification Page 20, Line 30 gives Equation 2 as $d = f(T_{HS}, t_{exc})$. Specification Page 22, Line 27 gives $d = f(T_{HS}, t_{exc,}$ <other parameters>). Does this mean in reality, all the modeling is done using only the excitation time t_{exc} and not steady state amount of heat energy E_n? If so, does the applicant just claim to correlate d_n with T_{HS} and E_n, but not really do so? Or if he is correlating d_n with T_{HS} and $E_{n,}$ where is the procedure for converting t_{exc} to E_n and correlating d_n with T_{HS} and E_n described in the specification?

Claim 17, Lines 18-20 state, "determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model for printing of an image on the thermographic material". What is the meaning of "at least one"? What was the intention of using this "at least one"? If one of the heater elements is excited to t_{exc}, what happens to other heater elements? As per the claim Line 9, there are several hater elements associated with the region. If a plurality of heating elements is excited with t_{exc}, how does this affect E_n? In addition, if the mathematical model is of the form $f(T_{HS}, t_{exc})$ as shown in Specification Page 20, Line 30 or $d = f(T_{HS}, t_{exc,}$ <other parameters>) as shown in Specification Page 22, Line 27, you can only determine the excitation time and not the heat energy supplied to the energisable heater element. Additionally, you cannot determine the heat energy, only the amount of heat energy supplied.

Claim 17, Lines 24-25 state, "the best fit relationship is given by $d_i=f(t_{exc})$ where t_{exc} is an excitation time of a heater element". Is d_i same as the measures of the graphical output (d_n)?

What is the significance of using d_i in stead of d_n? When do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$ and $d_n=f(t_{exc})$? Or is the relationship $d_n = f(T_{HS}, E_n)$ or $f(T_{HS}, t_{exc})$? Do you mean to say that you use all these numerous relationships and claim all these? If so what are the rules to decide when to use one these numerous relationships and where are they described in the specification?

Claim 17, Lines 25-27 state, "this relationship is corrected when using the printing system at a different line time by adding an offset Δt_{exc} to t_{exc}". What is the purpose of this correction? What is the line time? What is the reference line time? While the Examiner can interpret the claim using the description provided in the specification, the Examiner is required to use wide interpretation of the terms in rejecting the claims. Therefore, the applicant is required to provide meanings of line time and reference line time in this claim. When do you need to correct this t_{exc}? What are the rules for correction? How does it affect the mathematical model used to control the print head? This whole correction process is not understood. May be the various steps involved in this correction process should all be included in this claim. The variable "i" is not defined in the equation.

6.13 Claim 19, Lines 9-10 state, "each of the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements". The "each of the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements" is vague and indefinite, since it is not clear if there is one heater element in a region or a plurality of heater elements. If there is a plurality of heater elements in a region, are all these

heater elements provided with same constant amount of heat energy? The applicant's attention is also directed to Paragraph 6.1 above.

Claim 19, Lines 12-13 state, "for each of the several printed regions measured in a zone of each region where the graphical output was printed". What is a region? What is a zone?.How are they related? Figure 20 shows Item 34, which is described on Page 44, Lines 19-20 as several printed regions. Therefore, the printed regions are in the direction of movement of the paper. Figure 22 shows several zones printed in the direction of movement of the media. It appears that the region and zone are same. If so what is meant by zone of region?

Claim 19, Lines 11-13 state, "determine a measure of the graphical output for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal state". Does this mean that the measure of graphical output depends only on the different constant amount of heat energy delivered to the heater elements and no more on the heat sink temperature? How is it other claims the measure of graphical output was correlated with the heat sink temperature, but not in actually controlling the real thermal printer? What is the purpose of independent claims 1, 8, 10 and 17 which used the heat sink temperature as a parameter in mathematical modeling? Is this just an academic exercise? Is thermal state different from a thermal steady state? Does the printer have capability to automatically measure the graphical output for each of the several printed regions? What type of instrumentation is used for this measurement and where is described in the specification? Is this instrumentation only part of the laboratory development system or is it part of all thermal printers made for the

customers? If it is part of the commercial printers, then this instrumentation will add to the cost of the printers. Where is this discussed in the specification?

Claim 19, Lines 14 to 18 state, "establishing a mathematical model of thermal steady state printing characteristics by determining a best fit relationship between the measure of the graphical output for each of the several printed regions and the different constant amounts of heat energy for each of the several printed regions". This language is not understood. Is the best fit relationship established a relationship between the d_n and the constant amounts of heat energy? Is it of the form $d_n = f(E_n)$? If so when do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$? Or is the relationship $d_n = f(T_{HS}, E_n)$?

Specification Page 7, Lines 17-20 state that the graphical output of the calibration printout can be linked with the excitation used on the heater element and the heat sink temperature, if necessary supplemented with additional parameters. Does this mean the graphical output is a function of excitation time t_{exc}? Specification Page 8, Lines 18-24 state that the invention relates to a mathematical model relating the graphical output d_n of the heater element in a function of the heat sink temperature T_{ref} of every heater element and the used steady state amount of heat energy E_n. The function is written as: $d_n = f(T_{ref}, E_n)$. Specification Page 10, Line 17 shows d only as a function of T_{ref} and t, which is the excitation time. The energy is not used here. If the functional relationship can be written as $d_n = f(T_{ref}, E_n)$ or $d_n = f(T_{ref}, t_{exc})$, it would be better to write to sets of claims one for the energy relationship and another for excitation relationship, to make clear what the applicant is intending to state.

Specification Page 20, Line 30 gives Equation 2 as $d = f(T_{HS}, t_{exc})$. Specification Page 22, Line 27 gives $d = f(T_{HS}, t_{exc},$ <other parameters>). Does this mean in reality, all the modeling is done using only the excitation time t_{exc} and not steady state amount of heat energy E_n? If so, does the applicant just claim to correlate d_n with T_{HS} and E_n, but not really do so? Or if he is correlating d_n with T_{HS} and E_n, where is the procedure for converting t_{exc} to E_n and correlating d_n with T_{HS} and E_n described in the specification?

6.14 Claim 23, Lines 10-11 state, "a different steady state amount of heat energy delivered to the energisable heater elements". Does each region have one heater element or a plurality of heater elements? How are the heater elements associated with the region? Applicant's attention is also directed to Paragraph 6.1 above.

Claim 23, Lines 12-13 state, "a parameter related to a temperature of the heat sink". What is a parameter related to a temperature of the heat sink? How is it calculated and what is it called? Where is it described in the specification? How is it different from the temperature of the heat sink?

Claim 23, Lines 13-15 state, "for each of the several printed regions measured in a zone of each region where the graphical output was printed". What is a region? What is a zone? How are they related? Figure 20 shows Item 34, which is described on Page 44, Lines 19-20 as several printed regions. Therefore, the printed regions are in the direction of movement of the paper. Figure 22 shows several zones printed in the direction of movement of the media. It appears that the region and zone are same. If so what is meant by zone of region?

Claim 23, Lines 12-15 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state". This means that the measure of graphical output is functionally correlated with the temperature of the heat sink. What is the process involved in establishing this functional relationship? Does this mean the functional relationship is of the form $d_n = f(T_{HS})$?

Claim 23, Lines 12-15 state, "determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink for each of the several printed regions". Is the heat sink part of the thermal head? Is what the applicant called temperature of the heat sink same as the temperature of the thermal head at the nib? Do the heat sink temperature and the thermal head temperature mean one and the same? The applicant is directed to the discussion in Paragraph 6.1 above.

Claim 23, Lines 16-19 state, "establishing the mathematical model by determining a best fit relationship between the measure of the graphical output as the function of at least the parameter related to the heat sink temperature and the steady state amount of heat energy". This language is not understood. It is very vague and indefinite and the applicant is directed to explain this language. The "the measures of the graphical output as the function of at least the parameter related to the heat sink temperature" was used in the previous paragraph and was interpreted as the functional relationship is of the form $d_n = f(T_{HS})$. Then is the best fit relationship established a relationship between the d_n and the steady state amounts of heat

energy? Is it of the form $d_n = f(E_n)$? If so when do you use $d_n = f(T_{HS})$ and when do you use $d_n = f(E_n)$? Or is the relationship $d_n = f(T_{HS}, E_n)$?

Specification Page 7, Lines 17-20 state that the graphical output of the calibration printout can be linked with the excitation used on the heater element and the heat sink temperature, if necessary supplemented with additional parameters. Does this mean the graphical output is a function of excitation time t_{exc}? Specification Page 8, Lines 18-24 state that the invention relates to a mathematical model relating the graphical output d_n of the heater element in a function of the heat sink temperature T_{ref} of every heater element and the used steady state amount of heat energy E_n. The function is written as: $d_n = f(T_{ref}, E_n)$. Specification Page 10, Line 17 shows d only as a function of T_{ref} and t, which is the excitation time. The energy is not used here. If the functional relationship can be written as $d_n = f(T_{ref}, E_n)$ or $d_n = f(T_{ref}, t_{exc})$, it would be better to write to sets of claims one for the energy relationship and another for excitation relationship, to make clear what the applicant is intending to state.

Specification Page 20, Line 30 gives Equation 2 as $d = f(T_{HS}, t_{exc})$. Specification Page 22, Line 27 gives d = f(T_{HS}, t_{exc}, <other parameters>). Does this mean in reality, all the modeling is done using only the excitation time t_{exc} and not steady state amount of heat energy E_n? If so, does the applicant just claim to correlate d_n with T_{HS} and E_n, but not really do so? Or if he is correlating d_n with T_{HS} and E_n, where is the procedure for converting t_{exc} to E_n and correlating d_n with T_{HS} and E_n described in the specification?

6.15 Claims rejected but not specifically addressed are rejected because of their dependence on rejected claims.

6.16 The claims have been written without good knowledge and understanding of the contents in the detailed description. The claims have numerous vague and indefinite terms and concepts. Therefore, these claims will never be allowed by the review team at the USPTO. Any amount of 40 or 60 page arguments demonstrating lack of knowledge and understanding of the contents of the specification will be wastage of applicant's, attorney's and the Examiner's time, but will not advance the application towards allowance. The applicant is advised not to pursue such a course. If the applicant ever wants to get a patent out of this application, the applicant is advised to carefully read all the 112 Second rejections in Paragraphs 6.1 to 6.15 above, list the issues raised, get the answers from the detailed description in the specification and rewrite all claims. Such an approach will expedite the examination and allowance process.

7. Claim 19 is rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential structural cooperative elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

Claim 19 states in the preamble, "thermal printer for printing an image onto a thermographic material". Then under the limitations it states, "thermal printer comprising:

a control unit; and

a thermal head incorporating a plurality of energisabe heater elements, the thermal head being driven by the control unit, wherein

the control unit is adapted to control driving of the thermal printer …to make a reference printout on the thermographic material, … comprising several printed regions, …

the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements,

the control unit …being adapted to determine a measure of the graphical output for each of the several printed regions …, and

the control unit establishing a mathematical model of thermal steady state printing characteristics by determining a best fit relationship between the measure of the graphical output for each of the several printed regions and the different constant amounts of heat energy".

So the control unit prints several regions with different amounts of heat energy and determines a measure of the graphical output for each of the several printed regions and builds the mathematical model. But that does not achieve the purpose of the mathematical model. Is not the mathematical model used to drive the thermal printer later on based on desired print patterns to be printed? Is it all academic exercise of building the model but not using it? How is it that the thermal printer achieves printing an image onto a thermographic material? Just by experimentation only and not by real application? If not, there should be a step to use the mathematical models built to drive the thermal printer in real printing application.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

9. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1-5, 7, 10-14, 16 and 23-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Meeussen et al.** (U.S. Patent 5,664,893), and further in view of **Stephany et al.** (U.S. Patent 5,519,419).

10.1 **Lukis et al.** teaches Method and apparatus for controlling a thermal print head. Specifically, as per Claim 1, **Lukis et al.** teaches a method for generating a mathematical model of thermal printing characteristics of a thermal printing system using a computing device (Fig. 11; CL12, L11-14; CL12, L18-19), the thermal printing system comprising a thermal printer having a thermal head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31), and a thermographic material (CL1, L38-39; CL1, L41-43).

Lukis et al. does not expressly teach the thermal printing system comprising a thermal printer having a heat sink. **Meeussen et al.** teaches the thermal printing system comprising a thermal printer having a heat sink (CL2, L22-24; Fig. 8). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Lukis et al.** with the method of **Meeussen et al.** that included the thermal printing system comprising a thermal printer having a heat sink, because the temperature of the heating elements is affected by the temperature of the heat sink; and it is necessary to compute the temperature of the heating elements taking into account the temperature of the heat sink and adjust the applied energy to the heating elements based on the estimated temperature of the heating elements (CL2, L40-47).

Lukis et al. and **Meeussen et al.** do not expressly teach making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region. **Stephany et al.** teaches making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region (CL6, L62 to CL7, L10: CL7, L40-45). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Lukis et al.** and **Meeussen et al.** with the method of **Stephany et al.** that included making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region, because that would allow a series of calculations to

be carried out in a self-calibrating system capable of producing spots under given initial conditions with changing temperature of the thermographic material or heating elements in the course of the printing process (CL6, L62-67); to use the information to develop a plurality of relationships between the temperature of then print head and the measured density of the test patch (CL7, L9-10); and use the relationships in the course of actually printing a desired image on a print sheet by measuring the temperature of the print head, feeding the temperatures continuously into a selected function to obtain necessary pulse duration to the heating elements (CL7, L28-34).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state. **Stephany et al.** teaches determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL6, L62 to CL7, L10: the print head is caused by the controller to produce a set of heating areas to change the temperature of the print head, followed by a series of test patches of same halftone density, the actual densities of which are measured by densitometer; as each test patch is printed by the print head, the thermistor associated with the print head takes a

temperature reading ; there is thus obtained a plurality of relationships between the temperature of the print head and the measured density of the test patch).

Lukis et al. teaches establishing the mathematical model as a function of at least the parameter related to the temperature of the thermographic material and the steady state amounts of heat energy (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as a function of at least the parameter related to the heat sink (print head) temperature and the steady state amounts of heat energy. **Stephany et al.** teaches establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as the function of at least the parameter related to the heat sink (print head) temperature and the steady state amounts of heat energy (CL7, L11-13: heat sink temperature is same as the thermal head temperature, in the instant application; CL7, L40-47).

Per Claim 2: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** teaches that the heat energy E_n is represented by a given equivalent time (t_{exc}) used for powering at least one of the heater elements with an equivalent constant power (P_0), $E_n=t_{exc}*P_0$ (CL2, L11-13; CL10, L53-61; Fig. 5; Fig. 7; CL7, L53-59; CL7, L60 to CL8, L8).

Per Claim 3: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** and **Meeussen et al.** do not expressly teach while making the

reference printout, logging of parameters that are determinative to the graphical output. **Stephany et al.** teaches while making the reference printout, logging of parameters that are determinative to the graphical output (CL6, L62 to CL7, L10).

Per Claims 4 and 5: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing a table (T) of data comprising a steady state graphical output measure (d_n), and the steady state amount of energy (E_n or t_{exc}), giving an implicit relationship between the graphical output measure (d_n) and its controlling parameter (E_n, or t_{exc}); and parameters (P_n) that are determinative of the steady state graphical output measure (d_n). **Stephany et al.** teaches establishing a table (T) of data comprising a steady state graphical output measure (d_n), and the steady state amount of energy (E_n or t_{exc}), giving an implicit relationship between the graphical output measure (d_n) and its controlling parameter (E_n, or t_{exc}); and parameters (P_n) that are determinative of the steady state graphical output measure (d_n) (CL6, L62 to CL7, L17).

Per Claim 7: **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** teaches that a printing pattern of the reference printout is selected so that the pixels being printed do not interact with each other (CL1, L16-29).

10.2 As per Claim 10, **Lukis et al.** teaches a method for driving a thermal print head of a thermal printing system (Fig. 11; CL12,Abstract, L4-6; CL1, L11-13; CL1, L16-22; CL1, L31-

37), comprising a thermal printer having a thermal head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31), and a thermographic material (CL1, L38-39; CL1, L41-43), said method comprising:

in a first mode establishing a mathematical model (Fig 11; CL12, L11-14; CL12, L18-19).

Lukis et al. does not expressly teach the thermal printing system comprising a thermal printer having a heat sink. **Meeussen et al.** teaches the thermal printing system comprising a thermal printer having a heat sink (CL2, L22-24; Fig. 8).

Lukis et al. and **Meeussen et al.** do not expressly teach making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region. **Stephany et al.** teaches making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region (CL6, L62 to CL7, L10: CL7, L40-45).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach determining a measure of graphical output as a function of at least a parameter

relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state. **Stephany et al.** teaches determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL6, L62 to CL7, L10: the print head is caused by the controller to produce a set of heating areas to change the temperature of the print head, followed by a series of test patches of same halftone density, the actual densities of which are measured by densitometer; as each test patch is printed by the print head, the thermistor associated with the print head takes a temperature reading ; there is thus obtained a plurality of relationships between the temperature of the print head and the measured density of the test patch).

Lukis et al. teaches a establishing the mathematical model as a function of at least the parameter related to the temperature of the thermographic material and the steady state amounts of heat energy (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing the mathematical model by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy. **Stephany et al.** teaches establishing the mathematical model by determining a best fit relationship between the measures of the graphical output and the constant amounts of heat energy (CL7, L11-13; CL7, L40-47).

Lukis et al. teaches in a second mode determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model for printing of an

image on the thermographic material using the thermal printing system (CL11, L21-33; CL11, 40-44; CL12, L11-14; CL12, L18-22), comprising the thermal printer having the thermal print head incorporating the plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31).

Lukis et al. and **Stephany et al.** do not expressly teach the thermal printing system comprising the thermal printer having the heat sink; and a current value of the parameter related to the heat sink temperature. **Meeussen et al.** teaches the thermal printing system comprising the thermal printer having the heat sink (CL2, L22-24; Fig. 8); and a current value of the parameter related to the heat sink temperature (CL2, L40-47).

10.3 As per Claims 11-14 and 16, these are rejected based on the same reasoning as Claims 2-5 and 7, supra. Claims 11-14 and 16 are method claims having the same limitations as Claims 2-5 and 7, except they depend on claim 10. Therefore, they are taught throughout by **Lukis et al.**, **Meeussen et al.** and **Stephany et al.**

10.4 As per Claim 23, **Lukis et al.** teaches a machine readable data storage device storing a computer program product of for executing a method for generating a mathematical model of thermal steady state printing characteristics of a thermal printing system using a computing device (Fig. 11; CL12, L11-14; CL12, L18-19), the thermal printing system comprising a thermal printer having a thermal head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31), and a thermographic material (CL1, L38-39; CL1, L41-43).

Lukis et al. does not expressly teach the thermal printing system comprising a thermal printer having a heat sink. **Meeussen et al.** teaches the thermal printing system comprising a thermal printer having a heat sink (CL2, L22-24; Fig. 8).

Lukis et al. and **Meeussen et al.** do not expressly teach making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the energisable heater elements. **Stephany et al.** teaches making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the energisable heater elements (CL6, L62 to CL7, L10: CL7, L40-45).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the (heat sink) thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state. **Stephany et al.** teaches determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a

thermal steady state (CL6, L62 to CL7, L10: the print head is caused by the controller to produce a set of heating areas to change the temperature of the print head, followed by a series of test patches of same halftone density, the actual densities of which are measured by densitometer; as each test patch is printed by the print head, the thermistor associated with the print head takes a temperature reading ; there is thus obtained a plurality of relationships between the temperature of the print head and the measured density of the test patch).

Lukis et al. teaches establishing the mathematical model as a function of at least the parameter related to the temperature of the thermographic material and the steady state amounts of heat energy (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing the mathematical model by determining a best fit relationship between the measure of the graphical output as the function of at least the parameter related to the temperature of the heat sink and the steady state amount of heat energy for each of the several printed regions. **Stephany et al.** teaches establishing the mathematical model by determining a best fit relationship between the measure of the graphical output as the function of at least the parameter related to the temperature of the heat sink and the steady state amount of heat energy for each of the several printed regions (CL7, L11-13: heat sink temperature is same as the thermal head temperature, in the instant application; CL7, L40-47).

Per claims 24, 25 and 26: **Lukis et al.** and **Meeussen et al.** do not expressly teach that graphical output measure is a measure of density information; graphical output measure is a measure of pixel size; and the temperature of the heat sink is measured at multiple positions of

the heat sink. **Stephany et al.** teaches that graphical output measure is a measure of density information (CL5, L62 to CL6, L1; CL7, L4-6); graphical output measure is a measure of pixel size (CL6, L62-67); the temperature of the heat sink is measured at multiple positions of the heat sink (CL7, L1-8: measuring the heat sink temperature is same as measuring the thermal head temperature in the instant application).

Per claim 27: **Lukis et al.** teaches that each of said multiple positions corresponds to one of said heater elements (CL1, L18-22).

11. Claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Meeussen et al.** (U.S. Patent 5,664,893), and further in view of **Stephany et al.** (U.S. Patent 5,519,419) and **Carnahan et al.** ("Applied Numerical Methods", John Wiley and Sons, 1969).

11.1 As per Claim 6, **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al.** and **Meeussen et al.** do not expressly teach that the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T). **Stephany et al.** teaches that the best fit relationship is a parametrisable function (f()) (CL7, L11-13; CL7, L20-27).

Lukis et al., Meeussen et al. and **Stephany et al.** do not expressly teach that the best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T). **Carnahan et al.** teaches that the

best fit relationship is a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T) (Page 1, CL2, Para 2 to Page 3, CL1, Para 2). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Lukis et al., Meeussen et al.** and **Stephany et al.** with the method of **Carnahan et al.** that included the best fit relationship being a parametrisable function (f()), being defined by a set of unknown coefficients (a,b,c,d,...) found using a curve fitting process on the table (T), because the most common approximating functions relating input and output variables of experiments stored in tables are linear combinations of functions drawn from a class of functions $g(x) = a_0 x + a_1 x + a_2 x^2 + \ldots + a_n x^n$ (Page2, CL1, Para 1; CL2, Para 1; the a_0, a_1, a_2 and a_n correspond to unknown coefficients (a,b,c,d,...)); such an approximating function can give good approximation for the actual function f(x) between the input and output variables of an experiment; and the error in the approximation can be made arbitrarily small (Page 3, CL1, Para 2).

11.2 As per Claim 15, it is rejected based on the same reasoning as Claim 6, supra. Claim 15 is a method claim having the same limitations as Claim 6, except it depends on claim 10. Therefore, it is taught throughout by **Lukis et al., Meeussen et al., Stephany et al.** and **Carnahan et al.**

12. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Meeussen et al.** (U.S. Patent 5,664,893), and further in view of **Stephany et al.** (U.S. Patent 5,519,419) and **Haraguchi et al.** U.S. Patent 6,002,498).

12.1 As per Claim 9, **Lukis et al., Meeussen et al.** and **Stephany et al.** teach the method according to claim 1. **Lukis et al., Meeussen et al.** and **Stephany et al.** do not expressly teach that said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10). **Haraguchi et al.** teaches that said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10) (CL13, L44-54). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Lukis et al., Meeussen et al.** and **Stephany et al.** with the method of **Haraguchi et al.** that included said graphical output (d_n) is a pixel with a certain colour spectral density in the centre of the pixel and/or a pixel with a certain size defined by a perimeter having a given colour spectral density, to be reproduced on said thermographic material (10), because that would allow obtaining a conversion function between analytical density representing an amount of dye from spectral densities of a color image; and the color reproducibility of a color image can be improved by reading a color image using an image reading apparatus and making a print on an image forming apparatus from the spectral density of the color image read by the image reading apparatus (CL1, L10-19).

12.2 As per Claim 18, it is rejected based on the same reasoning as Claim 9, supra. Claim 18 is a method claim having the same limitations as Claim 9, except it depends on claim 10.

Therefore, it is taught throughout by **Lukis et al.**, **Meeussen et al.**, **Stephany et al.** and **Haraguchi et al.**

13. Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Lukis et al.** (U.S. Patent 5,661,514) in view of **Stephany et al.** (U.S. Patent 5,519,419).

13.1 As per Claim 19, **Lukis et al.** teaches a thermal printer for printing an image onto a thermographic material (Fig. 11; Fig. 12; Abstract, L4-6; CL1, L11-13; CL1, L31-37; CL1, L38-39; CL1, L41-43), the thermal printer comprising:

a control unit (Fig. 11; Fig. 12; Abstract, L4-6; CL1, L11-13; CL1, L31-37; CL1, L38-39; CL1, L41-43); and

a thermal head incorporating a plurality of energisabe heater elements, the thermal head being driven by the control unit (CL1, L18-22; CL1, L30-31).

Lukis et al. does not expressly teach that the control unit is adapted to control driving of the thermal printer so as to make a reference printout on the thermographic material, said reference printout comprising several printed regions, the driving of the thermal printer being such that each of the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements. **Stephany et al.** teaches that the control unit is adapted to control driving of the thermal printer so as to make a reference printout on the thermographic material, said reference printout comprising several printed regions, the driving of the thermal

printer being such that each of the several printed regions is printed with a different constant amount of heat energy delivered to the heater elements (CL6, L62 to CL7, L10: CL7, L40-45).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the (heat sink) thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** does not expressly teach the control unit furthermore being adapted to determine a measure of the graphical output for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal state. **Stephany et al.** teaches the control unit furthermore being adapted to determine a measure of the graphical output for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal state (CL6, L62 to CL7, L10).

Lukis et al. teaches the control unit furthermore being adapted to establish a mathematical model of thermal printing characteristics (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** does not expressly teach the control unit establishing a mathematical model of thermal steady state printing characteristics by determining a best fit relationship between the measure of the graphical output for each of the several printed regions and the different constant amounts of heat energy for each of the several printed regions. **Stephany et al.** teaches the control unit establishing a mathematical model of thermal steady state printing characteristics by determining a best fit relationship between the measure of the graphical output for each of the several printed regions and the different constant amounts of heat energy for each of the several printed regions (CL7, L11-13; CL7, L40-47).

Per Claim 20: **Lukis et al.** and **Stephany et al.** teach the control unit according to claim 19. **Lukis et al.** teaches the control unit furthermore being adapted for determining a heat energy to be supplied to at least one energisable heater element in accordance with the mathematical model (CL11, L21-33; CL11, 40-44; CL12, L11-14; CL12, L18-22).

Applicants arguments

14. Applicants arguments with respect to claim rejections under 35 USC 112 First Paragraph, 35 USC 112 Second Paragraph, 35 USC 101 and 35 USC 103 (a) filed on November 12, 2007 have been considered. Claim rejections under 35 USC 112 First paragraph and 35 USC 101 are withdrawn in response to claim amendments made. Claim rejections under 35 USC 112 Second paragraph and 35 USC 103 (a) have been modified in response to claim amendments made and applicant's arguments.

14.1 As per applicant's argument that "The Examiner has stated that "determining a measure of the graphical output as a function of at least a parameter relating to the heat sink temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state" is not supported in the specification; the Examiner contends that the specification does not show a functional relationship between a measure of the graphical output and a parameter relating to the heat sink temperature; "Only functional relationships among a measure of the graphical output, the excitation time or energy and the heat

sink temperature ... are shown"; in response, Applicant notes that the heat sink temperature itself is a parameter relating to the heat sink temperature; Paragraph 48 of the published application further discloses the relationship between a measure of the graphical output and a parameter relating to the heat sink temperature", the Examiner takes the position that stating "the heat sink temperature itself is a parameter relating to the heat sink temperature" is not a proper argument; similarly stating that Paragraph 48 of the published application further discloses the relationship between a measure of the graphical output and a parameter relating to the heat sink temperature is not a proper argument. The applicant's argument does not answer the question as to what is the parameter related to the heat sink temperature and how it is calculated and what it is called. Where is the derivation of the parameter relating to the heat sink temperature shown in the specification?

14.2 As per applicant's argument that "Lukis et al. is silent with respect to the construction of a thermal head and more particularly the presence of a heat sink, the influence of the heat sink upon the performance of the thermal head and the influence of the construction of the thermal head upon the performance of the thermal head in general; Meeussen addresses the temperature of the thermal print elements rather than the temperature of the heatsink; Meeussen provides no hint or indication of an alternative method for solving the problem of the adverse effect of the construction of the thermal head upon the characteristics of the printed images; Applicant therefore contends that one skilled in the art would have no motivation for combining the teaching of Lukis et al. with that of Meeussen et al. with a view to solving the problem of the adverse effect of the construction of the thermal head upon the characteristics of the printed

image', the Examiner takes the position that the heat sink is part of the thermal head in the Applicant's instant invention. The heat sink is also part of the thermal head in the thermal printer described by Meeussen. Therefore, the construction of the thermal head is considered by the Meeussen reference. Though the Lukis et al. does not mention the heat sink, the thermal head has the heat dissipation capability and therefore acts as the heat sink. The heat sink is inherently present in the Lukis et al. thermal printer. Therefore, one of ordinary skill in the art would be motivated to combine the teaching of Lukis et al. with that of Meeussen et al.

In the instant application, Figure 1 shows the thermal print head, 2. It has the print head support, 6 and a heat sink structure 24. Specification Page 5, Lines 8-9 state that the biggest part of the heat energy goes to the thermal head support with the heat sink. Lines 13-14 state that thermal heads with a large heat flow to the heat sink allow to print faster than heads with limited heat leakage to the heat sink. Therefore, it is implied that heat sink is part of the thermal head. Specification Page 8, Line 12-17 state that thermal sensors are mounted at several places in the thermal head; from the output of these sensors, a reference temperature can be calculated for every nib in the head; this reference temperature is often the temperature of the heat sink close to the considered nibs. This also implies that what the applicant called as temperature of the heat sink is same as the temperature of the thermal head at the nib. Specification page 20, Lines 14-15 state that the invention concentrates on the effect of heat sink temperature in the print head. This also implies that heat sink temperature and the thermal head temperature mean one and the same. Specification page 23, Lines 10-14 state that the whole heat sink has a homogeneous temperature, meaning that heater elements should be excited all over the thermal head, giving a

good symmetrical heating of the heat sink; the definition of T_{HS} is a mean value of the heat sink temperature taken all along the heat sink. This also implies that the heat sink temperature is same as the thermal head temperature.

14.3 As per applicant's argument that "Stephany et al. belongs to the art of thermal ink- jet printing in which a thermal impulse is used to cause a mini-explosion in the ink-jet ink-supply such that ink is ejected onto a distant ink-jet receiving material; this is an entirely different technical problem than that present in thermal head printers in which heating elements are in direct contact with a thermally sensitive material ... a particular heating element being influenced by prior heating of adjacent heating elements... contrary to the Examiner's assertion that Stephany teaches determining a measure of the graphical output as a function of a parameter relating to a heat sink, Stephany does not even appear to discuss a heat sink ... Stephany bears no relationship to the problem solved by the present application, namely compensating for the adverse effect of the construction of the thermal head upon the characteristics of the printed image; the claimed invention would not be obvious to one of ordinary skill in the art having Lukis, Meeussen and Stephany before him; the combination of these references, even combined with the knowledge of one of ordinary skill, would not yield the claimed invention", the Examiner respectfully disagrees.

The Examiner used Lukis for the thermal printer with thermal head, individually energisable heating elements and the direct printing on the thermographic material. The thermal head has the heat dissipation capability and the mathematical models developed by the Lukis

reference takes into account this heat dissipation by the thermal head. The Meeussen reference was used for explicit inclusion of the heat sink in the thermal head. The Stephany was used for calibration printing on a sheet with different amount of heat applied to the heating elements and measuring the density and size of the pixels during calibration printing. The measured values are then used to develop best fit relationship between the heat energy used and the resulting graphical output. Since all the three references deal with thermal printing, one of ordinary skill in the art will be motivated to combine Stephany reference with that of Lukis and Meeussen.

Lukis et al. teaches a method for generating a mathematical model of thermal printing characteristics of a thermal printing system using a computing device (Fig. 11; CL12, L11-14; CL12, L18-19), the thermal printing system comprising a thermal printer having a thermal head incorporating a plurality of energisable heater elements (CL1, L11-13; CL1, L16-22; CL1, L30-31), and a thermographic material (CL1, L38-39; CL1, L41-43).

Meeussen et al. teaches the thermal printing system comprising a thermal printer having a heat sink (CL2, L22-24; Fig. 8).

Lukis et al. and **Meeussen et al.** do not expressly teach making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state amount of heat energy delivered to the heater elements associated with that region. **Stephany et al.** teaches making a reference printout on the thermographic material, said reference printout comprising several printed regions with each of the several printed regions being printed with a different steady state

amount of heat energy delivered to the heater elements associated with that region (CL6, L62 to CL7, L10: CL7, L40-45).

Lukis et al. teaches a measure of the graphical output as a function of at least a parameter related to the thermographic material temperature for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state. **Stephany et al.** teaches determining a measure of graphical output as a function of at least a parameter relating to temperature of the heat sink (print head) for each of the several printed regions measured in a zone of each region where the graphical output was printed in a thermal steady state (CL6, L62 to CL7, L10: the print head is caused by the controller to produce a set of heating areas to change the temperature of the print head, followed by a series of test patches of same halftone density, the actual densities of which are measured by densitometer; as each test patch is printed by the print head, the thermistor associated with the print head takes a temperature reading ; there is thus obtained a plurality of relationships between the temperature of the print head and the measured density of the test patch).

Lukis et al. teaches establishing the mathematical model as a function of at least the parameter related to the temperature of the thermographic material and the steady state amounts of heat energy (CL12, L11-14; CL12, L18-19; CL7, L60 to CL8, L8; Fig. 5; Fig. 6 and Fig. 7). **Lukis et al.** and **Meeussen et al.** do not expressly teach establishing the mathematical model by

determining a best fit relationship between the measures of the graphical output as a function of at least the parameter related to the heat sink temperature and the steady state amounts of heat energy. **Stephany et al.** teaches establishing the mathematical model by determining a best fit relationship between the measures of the graphical output as the function of at least the parameter related to the heat sink temperature and the steady state amounts of heat energy (CL7, L11-13: heat sink temperature is same as the thermal head temperature, in the instant application; CL7, L40-47).

14.4 As per applicant's argument that "Haraguchi et al. is in the field of image processing of colored images comprising mixtures of dyes and bears no relationship to the problem solved by the present application, namely an alternative solution to the problem of the adverse effect of the construction of the thermal head upon the characteristics of the printed image", the Examiner takes the position that **Lukis et al.** and **Meeussen et al.** teach the method of taking into account the thermal head construction with heat sink in the modeling of heat dissipation through the thermal head with heat sink.

14.5 As per applicant's argument that "Lukis is silent with respect to the influence of a heat sink upon the performance of a thermal head, while Stephany belongs to the art of thermal ink-jet printing in which a thermal impulse is used to cause a mini-explosion in the ink- jet ink supply such that ink is ejected onto a distant ink-jet receiving material; neither Lukis nor Stephany would be remotely considered by one of ordinary skill in the art as starting points from which to address problems concerning the influence of the thermal print head construction upon

the characteristics of the printed image, and further, the combination does not teach the invention as claimed", the Examiner respectfully disagrees. The Applicant's attention is directed to Paragraph 14. 3 above.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez, can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

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K. Thangavelu
Art Unit 2123
January 27, 2008